

NASA TECH BRIEF

Ames Research Center



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Cutting Thin Sections of Bone

The problem:

A study of the healing of bone under high gravity stress after osteotomy required a more efficient method for obtaining repetitive planoparallel sections of bone. Ordinarily, pieces of bone are first removed as thick slices and then ground to the desired thickness by hand, but there are great losses of valuable material, and it is difficult to prepare the serial sections which are needed to show changes of structure at different levels within the bone composite.

The solution:

Use a water-cooled, very thin diamond saw to section bone embedded in plastic.

How it's done:

A diamond-saw machine of the type ordinarily used when laboratory work requires cutting of hard materials was equipped with a thin diamond-edged blade (0.31 mm). Unlike the thicker diamond-edged blades used for cutting hard materials, thin blades are more sensitive to cutting pressure and heat; as a result, the thin blades must be provided with better lubrication and operated at less cutting pressure, especially when the blades cut into plastic embedments at 6500 rpm. For use with thin blades, the machine was modified as follows: (1) A regulated water supply to the wheel was installed and provision was made to recirculate the water; (2) The water trough under the blade was enlarged and made of thicker plastic; (3) The rate of table advance was halved by increasing the size of the drive pulley; (4) The table support was changed to include grid markings and better clamps.

Constant water pressure and abundant flow of coolant water to prevent undue heating and blade oscillation while cutting was supplied by a water tank

supported above the machine table; the water level in the tank was maintained constant by a float valve. The water flow to the diamond wheel was further regulated by a second valve and then split by a forked stainless steel tube to provide three fine jets of water on each side of the cutting blade; the water pressure was regulated so as to assure equal and full runs of water onto each side of the blade. (Water carried by centrifugal force around the blade cools and lubricates the specimen.)

Ordinarily, the plastic-embedded bone specimen is mounted on a glass slide. The table support was modified to provide secure clamping of the specimens; a slide support, 5.08 cm by 15.24 cm with 0.538-cm grid markings, was installed to permit alignment of the glass slide parallel to the cutting blade. Clamps were made of slotted plastic with large-headed knurled-and-slotted clamping screws. A plastic wall was attached to the edge of the water trough and the original splash guard was removed to provide access to the blade, to ease handling of the mounted specimens, and to permit retrieval of floating sections.

Note:

Requests for additional information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
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Patent status:

No patent action is contemplated by NASA.

Source: William W. Ashley
Ames Research Center
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